A CYTOTAXONOMIC STUDY OF THE GENUS ACHILLEA IN PENNSYLVANIA[1]

Elwood B. Ehrle

The problem of speciation in the genus *Achillea* has received attention from workers at the laboratory of the Carnegie Institution of Washington in California (Clausen, 1951; Hiesey & Nobs, 1952; Ehrendorfer, 1952). These studies have been directed chiefly toward deciphering evolutionary trends and ecological specialization within this genus. Major study has been concentrated on forms from the Western United States and Europe. Very little is known of relationships among Achilleas of the Eastern United States.

Herbarium specimens of eastern material, located at various institutions in Pennsylvania, all bear the name *Achillea millefolium* L. The western species, *Achillea lanulosa* Nutt., has not been recognized in this state since all material of the genus has been somewhat automatically referred to *A. millefolium* L. Cronquist, in the new Britton and Brown Flora (Gleason, 1952), treats *A. lanulosa* Nutt. as a subspecies of *A. millefolium* L. and describes its distribution as occurring "toward the western part of our range" and "occasionally introduced eastward." The two forms are differentiated by Cronquist on the basis of the degree of crowding of the leaf segments and the shape of the ultimate segments.

A. millefolium L. *sens. strict.* is a European hexaploid with 54 somatic chromosomes, whereas American *A. lanulosa* Nutt. is tetraploid with 36 somatic chromosomes (Ehrendorfer, 1952). In his review of the geographical distribution of *Achillea* in North America, Lawrence (1947) included the three eastern records (Vermont, Mass., & N. Y.) for tetraploid *A. lanulosa* Nutt. as reported by Turesson (1939). No cytologically proven records of the existence in the east of the European hexaploid, *A. millefolium* L. *sens. strict.*, occur in the literature.

Twenty-six specimens of Achillea were collected in Pennsylvania during the winter of 1956 and the spring of 1957 and were grown in a greenhouse at the Pennsylvania State University.

[1] The aid of Dr. Paul Grun in the preparation of material and in the interpretation of cytological figures is gratefully acknowledged.

The leaves of these plants and those of herbarium specimens labeled *A. millefolium* or *A. lanulosa* from various parts of the United States were examined. It was not possible to separate the herbarium specimens or the growing plants into two categories on the basis of the shape of the ultimate segments or the degree of crowding, as the plants were highly variable with regard to these two characters.

When the plants were growing vigorously, root tips were collected, treated by the oxiquinoline method (Tijo and Levan, 1952), and stained with propio-orcein. The cells of all plants studied showed 36 somatic chromosomes. A list of these plants with their points of collection is shown in Table I. Many of the chromosomes (Fig. 1) were of equal length and had centrally located centromeres. Of those with sub-terminal centromeres, four satellite-bearing chromosomes were frequently discernible, indicating that this tetraploid species arose from satellite-bearing diploid precursors, either by auto- or allo-polyploidy.

The existence of tetraploid *Achillea* in Pennsylvania is thus demonstrated. These plants should, therefore, be referred to ecological races of the western tetraploid *A. lanulosa* Nutt. and not to European *A. millefolium* L. as is the current practice. It might be possible that the latter species will be found in the vicinity of seaports and other points of entry of European migrants.

TABLE I. Known distribution in Pennsylvania of tetraploid *A. lanulosa* Nutt.—verified by chromosome counts.

County	Locality	No. plants determined
Centre	State College	1
Clearfield	Caledonia Pike	1
"	Clearfield Bridge	3
"	Dimeling	4
"	Grampian	1
"	Kratzer Run	4
"	Lick Run	1
Clinton	Lamar	1
Huntingdon	Spruce Creek	2
Lycoming	Maple Hill	1
Perry	Mecks Corner	1
"	Millerstown	1
"	Shermandale	1
"	Waggoner Gap	1
Snyder	Kratzerville	1
"	Mt. Pleasant Mills	1
Union	Weikert	1

Fig. 1. Camera lucida diagram of the mitotic early metaphase chromosomes of tetraploid *Achillea lanulosa* Nutt., occurring at the side of Rt. 322 at Kratzer Run in Clearfield Co., Pennsylvania.

The presence of this species in such areas must, however, be proven before we can conclude that any *A. millefolium* L. *sens. strict.* exists in Pennsylvania.—DEP'T. OF BOTANY AND PLANT PATHOLOGY, PENNSYLVANIA STATE UNIVERSITY, UNIVERSITY PARK, PA.

Literature Cited

CLAUSEN, J. (1951) Stages in the Evolution of Plant Species. Cornell Univ. Press. Ithaca, N. Y.

EHRENDORFER, F. (1952) Cytotaxonomic studies in Achillea. Carnegie Inst. Wash., Yearbook #51, pp. 125–131.

GLEASON, H. A. (1952) The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada. Vol. 3, p. 385.

HIESEY, WM. M. & M. A. NOBS (1952) Genetic structure of climatic races and species of *Achillea*. Carnegie Inst. Wash., Yearbook #51, pp. 122–125.

LAWRENCE, WM. E. (1947) Chromosome numbers in Achillea in relation to geographic distribution. AJB; 34, pp. 538–545.

TIJO, J. H. AND A. LEVAN (1952) The use of oxiquinoline in chromosome analysis. Anal. de la Estacion Experimental de Aula 2, pp. 21–64.

TURESSON, G. (1939) North American types of *Achillea millefolium* L. Bot. Notiser 1939, pp. 813–816.